

CLAIMS:

1. A device for connecting a bone fragment to an anchor bone for a healing duration and for extending out of the bone during the healing duration, the device having an elongated shaft extending about a shaft axis and comprising:
 - a bone exterior section making up at least one third of a total length of the device;
 - and
 - a bone penetration section extending distally from the bone exterior section, the bone penetration section comprising:
 - a non-engaging fragment section; and
 - a bone anchor section located distally to the non-engaging fragment section, the bone anchor section having threads for engagement with the anchor bone, with a major diameter of the threads being greater than a shaft diameter of the non-engaging fragment section; and
 - a compression engagement on a distal end of the bone exterior section, the compression engagement providing a shoulder extending at a substantial angle to the shaft axis for substantial contact with an exterior surface of the bone fragment.
2. The device of claim 1, wherein the bone exterior section is longer than the bone anchor section.
3. The device of claim 2, wherein the bone exterior section is more than 45% of a total length of the device.

4. The device of claim 1, wherein the bone exterior section has threads of a shallower pitch than the threads of the bone anchor section, and wherein the compression engagement is provided by a nut rotatably supported on the threads of the bone exterior section.
5. The device of claim 1, wherein the bone exterior section has external threads which mate with internal threads on the compression engagement, and wherein the inside diameter of the internal threads on the compression engagement is smaller than the non-engaging fragment section such that the internal threads on the compression engagement cannot advance onto the non-engaging fragment section.
6. The device of claim 1, wherein the bone exterior section has threads of a different thread profile than the threads of the bone anchor section, and wherein the compression engagement is provided by a nut rotatably supported on the threads of the bone exterior section.
7. The device of claim 1, provided in a kit of a plurality of such devices each having a different length of non-engaging fragment section.
8. The device of claim 1, wherein the compression engagement has a proximal side with a sloped profile to assist in removing the compression engagement after a healing duration through tissue.
9. The device of claim 8, wherein a slope of the proximal side of the compression engagement increases from a gentle slope adjacent an outer diameter of the bone exterior section to a steeper slope distal to the gentle slope, thus providing a compression engagement of generally tear-drop cross-sectional shape.

10. The device of claim 1, wherein the compression engagement is permanently affixed to the bone exterior section.
11. The device of claim 1, wherein the shaft of the non-engaging fragment section is substantially smooth and cylindrical.
12. The device of claim 1, wherein the threads on the bone anchor section are self-tapping distally for insertion.
13. The device of claim 1, wherein the threads on the bone anchor section are self-tapping proximally for removal.
14. The device of claim 1, wherein the compression engagement has a tear drop cross-sectional shape, wherein the compression engagement is permanently affixed to the bone exterior section, wherein the shaft of the non-engaging fragment section is substantially smooth and cylindrical, and wherein the threads on the bone anchor section are self-tapping distally for insertion and self-tapping proximally for removal.
15. The device of claim 1, wherein the bone anchor section ends in a distal drill tip adapted for insertion in bone without pre-drilling.
16. The device of claim 1, wherein shoulder of the compression engagement has a curvature to contact the exterior surface of the bone fragment along the curvature.
17. A device for connecting a bone fragment to an anchor bone for a healing duration and for extending out of the bone during the healing duration, the device having an elongated shaft extending about a shaft axis and comprising:
 - a bone exterior section; and

a bone penetration section extending distally from the bone exterior section, the bone penetration section comprising:

- a non-engaging fragment section; and
- a bone anchor section located distally to the non-engaging fragment section, the bone anchor section having threads for engagement with the anchor bone, with a major diameter of the threads being greater than a shaft diameter of the non-engaging fragment section; and

a compression engagement on the bone exterior section, the compression engagement providing a shoulder extending at a substantial angle to the shaft axis for substantial contact with an exterior surface of the bone fragment, the compression engagement being axially movable on the bone exterior section.

18. A threaded compression device for placing a compression force on a fragment against an anchor substrate, comprising:

- a shaft running from a proximal end to a distal end about a shaft axis, the shaft comprising:
 - an anchor section on the distal end of the shaft, the anchor section having threads with a major diameter and a minor diameter;
 - a non-engaging fragment section proximal to the anchor section, the non-engaging fragment section having a diameter which is no greater than the minor diameter of the anchor section such that the non-engaging fragment section can fit within a profile drilled by the anchor section; and
 - an exterior section proximal to the non-engaging fragment section, the exterior section having a length which makes up at least one third of the length of the shaft; and
- a compression shoulder adapted for mounting on a distal end of the exterior

section of the shaft at a longitudinally adjustable position, the compression shoulder providing a contact surface which extends at an angle to the shaft axis for making contact with an exterior surface of the fragment.

19. A device for assisting in bone healing and growth, the device running from a proximal end to a distal end about a longitudinal axis, comprising:
 - an anchor section on the distal end, the anchor section having threads with a major diameter and a minor diameter;
 - a non-engaging fragment section proximal to the anchor section, the non-engaging fragment section having a smooth outer profile with a diameter which is no greater than the minor diameter of the threads of the anchor section;
 - a compression engagement proximal to the non-engaging fragment section, the compression engagement having a shoulder which extends at an angle relative to the longitudinal axis, the shoulder being at a diameter greater than the major diameter of the threads of the anchor section; and
 - a rotation section proximal to the compression engagement, the rotation section having a smooth outer diameter.
20. The device of claim 19, further comprising a pointed proximal tip for drilling through bone in a reverse direction.
21. A threaded compression device for placing a compression force on a fragment against an anchor substrate, comprising:
 - a shaft running from a proximal end to a distal end about a shaft axis, the shaft comprising:
 - a distal drill tip for forward insertion;

an anchor section on the distal end of the shaft next to the distal drill tip,
 the anchor section having threads with an anchor thread pitch;
 a proximal threaded shaft section proximal to the anchor section, the
 proximal threaded shaft section having threads with a
 compression thread pitch, the compression thread pitch being
 different than the anchor thread pitch; and
 a proximal drill tip for reverse insertion; and
 a compression shoulder adapted for mounting on the proximal threaded shaft
 section at an axially adjustable position, the compression shoulder
 providing a contact surface which extends at an angle to the shaft axis
 for making contact with an exterior surface of the fragment.

22. A reverse-taper threaded compression device for placing a compression force on a fragment against an anchor substrate, the compression device comprising:

an elongated shaft running from a proximal end to a distal end about a shaft
 axis, the shaft comprising:
 an anchor section on the distal end of the shaft, the anchor section having
 external threads for engagement with the anchor substrate with an
 anchor major diameter and an anchor minor diameter; and
 a fragment exterior section proximal to the anchor section, the fragment
 exterior section having external threads with a fragment exterior
 major diameter and a fragment exterior minor diameter; wherein
 the fragment exterior major diameter is less than the anchor
 major diameter; and
 a compression engagement adapted for mounting on the fragment exterior
 section, the compression engagement providing a contact surface which
 extends at an angle to the shaft axis for making contact with an exterior
 surface of the fragment, the compression engagement having internal

threads for mating with the external threads of the fragment exterior section enabling the compression engagement to be axially movable on the fragment exterior section.

23. The compression device of claim 22, wherein the fragment exterior minor diameter is less than the anchor minor diameter.
24. The compression device of claim 22, wherein the fragment exterior major diameter is no greater than a mean of the anchor major diameter and the anchor minor diameter.
25. The compression device of claim 24, wherein the fragment exterior major diameter is no greater than the anchor minor diameter.
26. The compression device of claim 22, wherein the threads on the anchor section are self-tapping distally for insertion.
27. The compression device of claim 22, wherein the threads on the anchor section are self-tapping proximally for removal.
28. A method of repairing a fractured bone, comprising:
screwing a device through a bone fragment, the device comprising:
an elongated shaft having a bone penetration section extending distally from a bone exterior section about a shaft axis, the bone penetration section being shorter than the bone exterior section, the bone penetration section including a fragment section and a bone anchor section located distally to the fragment section, the bone anchor

section having threads with a major diameter of the threads being greater than a diameter of the fragment section; and
a compression engagement on a distal end of the bone exterior section, the compression engagement providing a shoulder extending at a substantial angle to the shaft axis; and
further screwing the device such that the bone anchor section advances into an anchor bone with the fragment section in the bone fragment.

29. The method of claim 28, further comprising:
with the bone anchor section advanced into the bone fragment but prior to the act of further screwing the device into the anchor bone, manipulating the bone exterior section to reposition or bias the bone fragment relative to the anchor bone.
30. The method of claim 29, further comprising:
after the manipulating act, holding the bone exterior section in a desired alignment during the further screwing act.
31. The method of claim 28, wherein, after the further screwing act:
the fragment section extends through the bone fragment without threaded engagement with the bone fragment; and
the threads of the bone anchor section are in engagement with the anchor bone; and
the compression engagement is in substantial contact with an exterior surface of the bone fragment to bias the bone fragment toward the anchor bone.
32. The method of claim 28, further comprising:
moving the compression engagement axially on the elongated shaft to position the compression engagement in an axial position to make substantial contact

with an exterior surface of the bone fragment when the bone anchor section advanced to a final position.

33. The method of claim 32, wherein the screwing act and the further screwing act occur in a reverse direction such that the device is inserted into the anchor bone prior to engaging the bone fragment, while the moving the compression engagement axially on the elongated shaft occurs in a forward direction, opposite to the direction the device was introduced to the bone.

34. The method of claim 28, further comprising:
after the further screwing act, removing a portion of the bone exterior section so the bone exterior section does not extend as far outside the patient's tissue.

35. The method of claim 28, wherein the compression engagement has a proximal side with a sloped profile, and further comprising:
after a healing duration, removing the compression engagement through tissue with the sloped profile on the proximal side of the compression engagement assisting in separating tissue.

36. The method of claim 28, further comprising:
monitoring torque applied during the further screwing act.

37. A method of using a reverse-taper threaded compression device for placing a compression force on a fragment against an anchor substrate, the method comprising:
advancing an anchor section disposed on a distal end of a shaft of the compression device into the anchor substrate, such that external threads on the anchor section engage the anchor substrate;
advancing a compression engagement disposed on a fragment exterior section

proximal to the anchor section relative to the shaft, such that the compression engagement makes contact with an exterior surface of the fragment to bias the fragment toward the anchor substrate; cutting off a portion of the fragment exterior section, the cut preventing the compression engagement from axially retracting on the shaft.

38. The method of claim 37, further comprising:
removing the compression device from the anchor substrate by placing a reverse torque on the compression engagement.